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Balancing IPRs and agricultural innovation for development

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Abstract

International Agriculture Research Centres (IARCs) and other public research organisations increasingly find themselves exposed to intellectual property rights due to *inter alia* the advent of the intellectual property system, privatisation of research and increased collaboration with the private sector. There is an inherent theoretical conflict in the application of private rights for the provision of public goods given that IPRs introduce excludability to a good. But there is a distinction between the *existence* and *exercise* of IPRs. The latter, conducted creatively, can mitigate the excludability effect brought about by the former. Examples of the creative exercise of IPRs illustrate that IP capacity is vital. IARCs and other public research organisations particularly those in developing countries must invest in IP capacity in order to formulate creative IP policies and strategies and implement them in a manner that ensures their public goods mandate is not compromised.

Introduction

Recent developments in the international arena have exposed public sector research organisations – including those dealing with development issues such as agriculture – to intellectual property rights (IPRs). The advent of the international IPR regime and the concomitant protection of research tools and other technologies vital for research, the increased role of the private sector in agriculture, and the proliferation of public private partnerships (PPPs) are some of the developments that have transformed international agricultural research.

This paper explores the implications of applying IPRs in the conduct of agricultural research for public benefit. It argues that there is an inherent theoretical conflict in the application of IPRs in the provision of public goods such as agricultural research. However, an analysis of this effect is illuminating: there is a distinct difference in the *existence* and the *exercise* of IPRs. While the existence of private rights in the provision of public goods is in conflict theoretically, the way in which IPRs are exercised can mitigate this conflict. Whilst the evolution of IPRs moves agricultural research towards being a private good, reactionary, interventionist and other policy approaches may mitigate and/or reverse the trend. Public research organisations which find themselves exposed to IPRs must concentrate on ways that ensure the *exercise* of

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IPRs does not compromise their mandate for public goods research. This crucially requires investment in IP capacity and *inter alia*, the formulation of creative policies and strategies that address the paradox of serving the public interest through the use of public rights.

This article begins with a brief examination of the classical division of public and private goods in the context of agricultural research. Next, it enquires into the implications of applying IPRs in the conduct of public agricultural research and highlights when and why public agricultural research organisations apply or deal with IPRs. A brief analysis of IP policies in the Consultative Group on International Agriculture Research (CGIAR) follows; this shows that the CGIAR centres have policies that contemplate the existence of IPRs; the creative exercise of IPRs is demonstrated by use of a few examples from the IARCs.

Public goods and private goods

The main line of inquiry in this section is whether the characteristics of a good determine what sector is best suited to provide the said good. It necessarily begins with the examination of the nature of public and private goods. The goal is to determine what happens when pubic goods are provided through the use of private rights. Do they still remain public goods? A secondary question is whether the public sector is the generally most suited sector to provide public goods and if so, what happens when the exception pertains.

The debate on classification of goods can be traced back to Samuelson (1954) and Musgrave (1959). Samuelson used the “jointness of consumption” as the main attribute to divide all goods into two classes: private consumption goods and public consumption goods. According to Samuelson, “collective consumption goods” are those goods

> ‘… which all enjoy in common in the sense that each individual’s consumption of such a good leads to no subtraction from any other individual’s consumption of that good…’ (Samuelson 1954:1)

Jointness of consumption is also referred to as non rivalry, nonrivalry of consumption or indivisibility of benefits. Some authors do indeed use the terms interchangeably (Cornes & Sandler 1996).

Musgrave on the other hand argued that a different attribute – whether someone can be excluded from benefiting once the good is produced (excludability) – was more important that Samuelson’s rivalness attribute. Both aimed to show when market forces would perform optimally in the provision of specific classification of goods and when markets would fail.

Public goods are contrasted to private goods which are said to be rivalrous and excludable. Because few goods fall neatly into these two categories, other categories such as impure public goods and common pool resource are now recognised in addition to the two classical groups. Drahos underscores this by stating that ‘a public good is not a single good, but an effect with complex antecedents made up of a set of complementary goods (private and public) and different types of social actors’

(Drahos, 2004). Generally, these two criteria are used to distinguish pure public goods from private goods.

Pure public goods are therefore non-rivalrous and non-excludable so as to be accessible to growing numbers of people without any marginal cost. This quality – wide dispersion of benefits – renders them unsuitable for private entrepreneurship. Pure public goods are thus best provided for by the state.

Examples of pure public goods have been dwindling since the critique of the classical examples of the lighthouse and of national defence. It is now widely acknowledged that goods rarely fall neatly within the above criteria hence the recognition of club goods and common pool resources. According to Samuelson (1954), rivalrous goods, whether excludable or not could be efficiently provided through market mechanisms while Musgrave (1959), arguing that excludability was the determining factor, contended that market mechanisms are preferable for those goods that are excludable whether rivalrous or not. Similarly, Cornes & Sandler (1996) argue that nonexcludability is the crucial factor in determining which goods must be provided by the public sector.

The difficulty at assigning goods along the rivalry – excludability spectrum impacts on policy decisions on the provision of goods. Samuelson himself conceded that many goods commonly termed as public goods do not fit within his definition; (Samuelson, 1955) a significant amount of literature has been generated since some of which attempts to clarify and develop models relating to 'mixed goods' – those that lie somewhere between the extremes of pure private and pure public goods (e.g. Holtermann, 1972).

Indeed some public goods appear to have a mixture of private goods and public goods characteristics. Examples can be found in education, health, agriculture and the justice system where in practice, these are not consumed in equal amounts by everyone and one person's consumption decreases the amount available for other people to consume. Indeed, very few goods are truly public; it is the way they are made available and utilised that makes them public or not. Holtermann (1972) distinguishes between the provision and utilisation of a public good; its provision may be public in so far as it is equally available for everyone's consumption but its utilisation may contain aspects of private goods in that utilisation is different for different individuals and an increase in one person's utilisation decreases the amount available to others. Similarly, Pickhardt observes that most goods which give rise to private benefits also involve externalities in varying degrees thereby combining both public and private good characteristics (Pickhardt, 2002).

In determining if a good is a pure public good or a mixed good, Holtermann (1972) maintains that this will depend on whether an individual consumption unit can be defined and secondly, whether consumption is in the control of the consumer, at least in principle. He however concedes that the dividing line is not clear. Technology plays a part in blurring the distinction between public and private goods. For example, advances in ICT such as digital right management, encryption etc allow media companies to exclude customers from cable and satellite TV reception. Given that the world is finite, resources in it are finite too and the economic concept of scarcity applies ubiquitously so that public goods are not exempt. Strict non rivalry is therefore not possible (Musgrave, 1959, 1969).

The foregoing highlights the difficulty in clearly demarcating goods into pure public and private goods. The characteristics of a good generally determine what category it falls into; who provides the good is not a factor in determining whether a good is public or private. Most goods lie along the public goods – private goods continuum with characteristics of both public and private goods; the provision of such goods may be by either the public or private sectors or other sectors or a combination of any of these.

Agriculture research as a public good

But is agriculture research a pure public good? It is undisputed that the social returns to research investment (even when conducted by the private sector) possess some degree of public goods characteristics. Nelson (1959), Arrow (1962) and others (Mansfield *et. al.*, 1977; Ruttan, 2001) argued that social returns from private investment exceed private returns. Therefore, research conducted in public and private sectors and in combination of the two is likely to produce public goods. Gardner and Lesser (2003) argue that public agriculture research however does not produce pure public goods but impure public goods: *some* users cannot be excluded or charged for *some* uses of the goods produced. Dalrymple (2008) similarly posits that particularly due to its interaction with private research, public agricultural research is increasingly providing impure public goods rather than pure public goods.

Agriculture in its simplest form is no doubt a mixed good in that it contains both elements of public and private goods. The end product of agriculture – food – is a private good in so far as it is both rivalrous (once consumed, it no longer exists) and excludable (the owner can exclude others from consuming it). The land on which food is grown is likewise a private good. However, the technology and knowledge required in growing agronomically appropriate crops of high quality and yield is non-rivalrous. Further, the benefits of a healthy well fed nation impact on society as a whole. As such, government involvement in the provision of this mixed good is vital in order to ensure the overall positive social effect. This is particularly important in the present time given the growing disparity in wealth allocation exacerbated by changes brought about by globalisation (Duncan, 2005).

IPRs and the correction of market failure

In an ideal market, the price of each good should be equal to the cost borne by society in consuming it. If goods are produced above marginal cost, they will be under-consumed; if they are provided at marginal cost (free) they will tend to be under-produced as there will be no incentive to invest in their production. Pure public goods and some impure public goods represent the second scenario. Different mechanisms are used to correct this market failure; IPRs and government intervention are but two ways.

It would seem that knowledge or technology is a public good in that it is nonrival, nonexcludable and has positive externalities. IPRs alter the nature of technology from public to private by introducing excludability although not rivalry. Put simply, technology is expensive to produce and cheap to reproduce. Through licensing and royalties, some consumers are excluded although the technology remains nonrivalrous. However, even encumbered by IPRs, technology is still transformative. It may convert some public goods into private ones and vice versa.

The application of IPRs can result in under-consumption such as when IPRs result in vital drugs being prohibitively expensive so as to be out of reach of poor people. Barder (2003) distinguishes the application of IPRs to rival goods from their application to non-rival goods. He posits that when a good's consumption is rival, imposition of property rights helps to improve the use of scarce resources but argues that when applied to non-rival goods (such as knowledge), IPRs move society away from an optimum allocation of resources.

Barder (2003) explores different ways of rewarding creators of knowledge observing that the different ways have different distributional implications, different welfare impacts and influence nature of R&D differently. IPRs may lead to the pricing of important welfare goods e.g. crops protected by plant variety rights out of poor people's reach. The Golden Rice case where extensive patenting delayed research into beta-carotene fortified rice is a case in point. Application of IPRs may also distort research priorities such as when private companies choose to invest in commercial crops and neglect pro-poor orphan crops. This is especially important given that six companies hold 75 percent of all agricultural patents (Phillips, 2004) increasing the risk of non-delivery of agricultural inventions to the poor.

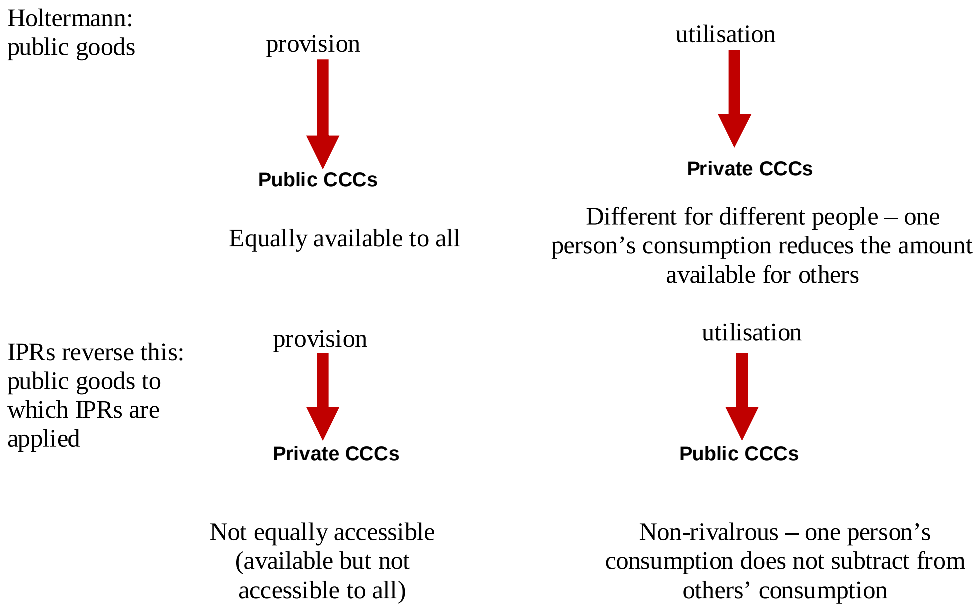
Even Adam Smith, the most ardent advocate of *laissez-faire*, recognised the need for government intervention in some select areas. This is needed in health, education and agriculture to reverse market failure, reduce transaction costs so as to enhance consumption or supply and hence positive externalities. Government intervention is needed to redirect research according to social value so as to promote creation of knowledge in areas with highest social return rather than according to the highest opportunity for rent extraction. This is particularly important given that the distributional impact of IPRs, social welfare costs and distortion of R&D are greater now than ever before. Research into problems affecting the poor is increasingly marginalised over the development of IP for which rich consumers are willing to pay.

The implications of applying IPRs in the provision of public goods

As earlier seen, IPRs introduce excludability into public goods. IPRs can be said to reverse Holtermann's classification according to which firstly, the provision of public goods has public characteristics in that the goods are equally available to all. The application of IPRs reverses this: the provision of public goods to which IPRs have been applied acquire private characteristics i.e. the goods may be available to all but are only accessible to those who can pay the added royalty costs (assuming these are present). Secondly, utilisation of public goods according to Holtermann has private characteristics: one person's consumption reduces the amount available for others' consumption e.g. hospital beds in health care, access to justice in the court system, etc. Where IPRs are applied to public goods, excludability in the provision of the goods concerned is traded off against non rivalry in the utilisation of the knowledge: the knowledge can be copied endlessly without being diminished and one person's consumption does not subtract from others' consumption.

The main objective of public research organisations is presumed to be the provision of research products for the general public. Most public research organisations will particularly focus on research affecting the marginalized sections of the public. The assumption is that the products of their research are equally available and accessible to everyone.

Figure 1: The effect of applying IPRs to public goods using Holtermann's classification



In theory therefore, there is an innate conflict in the application of IPRs to the provision of public goods. How does a public research organisation apply IPRs (which introduce excludability) while still maintaining their mandate to provide goods equally available and accessible to all? This inherent theoretical conflict has been the subject of many a debate; different public research organisations have had various reactions to this conflict between the philosophy of public research and the existence of IPRs.

Having established that there is an inherent conflict (at least in theory) of the application of IPRs to the provision of public goods, it has to be asked why public research organisations are faced with this dilemma. Why apply IPRs at all?

Why and when are public agricultural research organisations exposed to IPRs?

Trends in the last two decades are responsible for the exposure of public research organisations to IPRs. These include but are not limited to: a decline in public research funds and the pressure to generate income, the privatisation of research and the advent of the IP system.

The past decade has seen a constant decline in funds allocated for research in agriculture. In the face of many competing claims on donor aid, international agricultural research no longer commands priority in funding (Blakeney, 2002). Donor aid to IARCs increasingly hinges on the impact of institutions' research. One effect of this is the trend from basic to applied research and the subsequent involvement of other partners, including the private sector, in downstream product development. Another effect of public research budget austerity is the increasing pressure on IARCs to commercialise their products to supplement their income. Although income generation is hardly the main factor motivating patenting (or other form of IP protection) of research in IARCs, the reality is that IP protection has the potential to generate income for IARCs.

The changing agricultural R&D scene has raised vital issues which IARCs and other public research organisations have to address. Not the least of these is the question of whether income generation is consistent with the wider mandate of public research organisations to serve the needs of the poor farmers and maximise benefits to society as a whole (Fischer & Byerlee, 2002). Public research organisations face the challenge of balancing the need for income generation and that of the delivery of public goods.

There is perhaps no greater factor that has contributed more in exposing public research organisations to IPRs than the privatisation of research. Globalisation of R&D and the growing assertion of ownership of agricultural resources through the application of IPRs by both the private and the public sectors characterise the environment under which IARCs and other public research organisations currently operate.

In the fields of agriculture and health, partnerships between the public and the private sector enjoy remarkable acclaim and are currently hailed as crucial strategies for the delivery of global public goods in the respective fields. In some of these instances, the use of IPRs by public research institutes may be key in achieving the goal of promoting access. This is particularly true where private sector partners are required for say, the development, manufacture and or distribution of public research. In international agricultural research for example, it is common place for IARCs to partner with seed companies for the multiplication and distribution of seed.

In product development partnerships, IPRs facilitate the engagement of the private sector by providing crucial bargaining chips. IPRs are sometimes used to segment the market thereby enabling the achievement of public goods goal particularly in developing countries. For example, IPRs to a technology may be traded off for contractual obligations to deliver the product to developing countries at a reasonable price, i.e. the developed markets can be traded for control of sales in developing markets so as to ensure that demand in the latter is met. An example in health is research in malaria where the 'paying market' is low, the research partners may trade any other disease use for control of the IP for the neglected disease; the commercial partners may acquire the rights to the foreground IP pertaining to all other diseases save for the pro-poor disease the partnership addresses.

Although it is generally argued that patenting research tools inhibits further research and thereby limits innovation (e.g. Wright & Pardey, 2006; Clift, 2007), Boettiger and

Chi-ham (2007) argue that where access to complementary enabling technologies necessary to produce a product is blocked, an institution with a patent to one of the research tools required has more leverage than one that does not. They argue that ‘if an IP manager chooses not to patent an enabling technology... the ability to control its applications is lost’ (Boettiger & Chi-ham, 2007:38). Control of research products and tools then becomes a reason to seek IPRs. Policy questions of whether research tools *should* be patented aside, the reality is that public research organisations are more likely to patent enabling technologies now than they were in the past.

The same applies to subsequent improvement patents. Contrasting an IP manager who chooses not to patent a technology to one who does, Boettiger & Chi-ham posit that in the former case, ‘improvements to the technology are subsequently invented and patented, restricting the uses of the original technology’. In the latter, ‘the value of the subsequent improvement patent would depend on access to the underlying dominant patent’ (Boettiger & Chi-ham, 2007:38). These examples demonstrate the ‘reactionary’ nature that some public research institutes adopt in the current environment characterised by increasing privatisation of research.

Legal developments in some countries have transformed the public research environment and catalysed the public sector’s engagement with IPRs. A ready example is the United States’ Bayh-Doyle Act of 1980 which allowed federally funded universities to patent their research and license it to the private sector in line with ‘translational research’ objectives. University-industry partnerships and collaborations in the US increased dramatically as did university patents following the implementation of the Act.

Funding agreements with donors have similarly been known to expose public research institutes to IPRs by containing IP related clauses. It is not uncommon for funding agreements, particularly in product development public-private partnerships (PPPs), to reserve the right to retain control of the IP especially in late stage product development. This is often a safety net strategy to ensure production of the relevant technology in the event that a private sector partner forestalls the development of the designated product.

The advent of the IP regime has had a significant impact on the international agricultural research conducted for example by the Consultative Group on International Agricultural Research (CGIAR of CG). The CG is a strategic alliance of governments, donors and global research partners whose mission is to achieve sustainable food security and reduce poverty in developing countries through scientific research and research related activities. Research is conducted through fifteen IARCs. The CGIAR is the largest public investor in agricultural research in developing countries.

One of the ways in which this has occurred relates to the risk of seeking IP protection for CG germplasm by third parties. A number of high-profile cases occurring in the late 1990s bear evidence to this. In 1998, PBR applications were made in Australia for accessions obtained from two CG centres (Edwards & Anderson, 1998). Research by the Action Group on Erosion, Technology and Concentration (the ETC group, then known as the Rural Advancement Foundation International, RAFI) indicates that there could be more cases of this nature (RAFI, 1998). In developing countries, it is likely that such abuse of CG germplasm is carried out not only by the private sector in the form of the numerous small seed companies, but also by partners in National Agriculture Research Institutes (NARIs) in spite of the Material Transfer Agreements (MTAs) that are used to transfer CG germplasm to third parties.

Protecting technology has in some cases attracted the involvement of the private sector. In some of the collaborations with the private sector, the probability of developing proprietary technology with significant commercial implications cannot be ruled out as an important incentive for the private sector. In other cases, private seed companies, recognising the competitively high quality of plant genetic material bred by the CG centres, have been reluctant to distribute seed from the centres unless they can do so exclusively.

Similarly, dealings with the private sector have heightened the need for public research institutions to be IP savvy not in the least because of the danger of infringing IP belonging to a third party (Wolson, 2004) and the requirement to obtain freedom to operate. In other instances, IARCs use IPRs in order to ensure their technology is in the public domain. This is in accordance with the typical public research organisations' IP policy objective.

These are only a snapshot of the IP challenges that CG centres have to address in the context of research, commercialisation and protection of their products.

How do public agricultural research institutes reconcile IPRs with the fulfilment of their mandates?

The preceding section looked at *potential* reasons why, and circumstances where, public research organisations use intellectual property rights or are exposed to dealing with IPRs. Summarised, these are income generation, facilitating the delivery of research products to the public via the private sector, obtaining leverage with the private sector, avoiding infringing technologies protected by third parties and in order to avail research products in the public domain.

With regard to income generation, although the sale of IP protected research products can be beneficial in funding research costs, there is little formal analysis of the significance of the gains from using IP protection as a strategy for generating new revenues for research (Maredia, 2001). IARCs and other public research organisations can employ a number of ways to generate income to offset their budget deficit. Sale of non-research products and services such as soil and chemical testing, diagnostic tests, sale of commercial seed and vaccines and staff consultancies are income generating activities that are generally within the mandate of agricultural public research organisations. In the other instances above, it is more difficult to substitute other practices for the use of IPRs. This is where the creative *exercise* of IPRs is paramount.

So far, we have established that firstly, there is a conflict in theory in the application of IPRs in the provision of public goods. Secondly, public research organisations including IARCs increasingly find themselves having to use IP protected research tools and products belonging to third parties and in some instances, having to protect their own research products by use of IPRs.

This requires the creative *exercise* of IPRs. The excludability effect of IPR encumbered technology can be mitigated by policy and institutional changes. Consider that Microsoft in 2006 released 500 ICT patents before their expiry. CABI (a not-for-profit organisation specialising in scientific research, publishing and communication) agreed to put its books on the internet six months after their publication and on CD free of charge for developing countries. Private biotech firms have in some cases allowed freedom to operate (FTO) provisions to facilitate the use of IP protected technology in developing countries where it is unlikely that their commercial interests will be affected (Ryan, 2006). In 2000, Harold Vamus, Patrick Brown and Michael Eisen proposed the publication of high quality scientific journals under open access free PLoS journals. This system has proved to be successful; a publication in a PLos journal almost has the same impact factor as that that in *Science* or *Nature*.

These few examples illustrate that the existence of IPRs need not impair the provision of protected technology to the public; the policies underlying these decisions mitigate the excludability effect introduced when IPRs are applied to goods. The following section looks at the IP guidelines and policies relating to the Consultative Group on International Agriculture Research (CGIAR or CG) to determine firstly, if they contemplate the existence of IPRs and secondly, if and how they allow for the exercise of IPRs in a manner that mitigates the excludability effect thereby safeguarding the constituent centres' public goods mandate.

The CGIAR

The CGIAR is a strategic alliance of countries, international and regional organizations, and private foundations supporting 15 international agricultural centres. These CG centres work with national agricultural research systems and civil society organizations as well as the private sector. The CGIAR's mission is "to achieve sustainable food security and reduce poverty in developing countries through scientific research and research-related activities in the fields of agriculture, forestry, fisheries, policy, and environment." The CGIAR expressly states that it "generates global public goods that are available to all."

Material held by the CG centres falls broadly under two categories: the *Ex situ* germplasm collection held in trust otherwise known as designated germplasm; and breeding material developed by the individual centres. Virtually all of the *ex situ* germplasm collection is from countries in the South. There has been considerable debate over the status of this genetic material, to whom the CG is accountable and whether or not it is subject to IP protection. The FAO International Treaty on Plant Genetic Resources for Food and Agriculture (the ITPGR or the Treaty) attempts to answer these issues. The Treaty establishes a Multilateral System of access and benefit sharing into which contracting parties are obliged to place plant genetic resources for food and agriculture (PGRFA) under their management and control. The PGRFA to placed into the Multilateral System are listed in the Treaty's Annex 1. Eleven of the fifteen CG centres joined the Treaty as contracting parties in October 2006.

IP policy in the CGIAR system

The CG contemplated developing working principles on IP as early as 1991. These have had to be continually reviewed owing to a number of factors. To begin with, the

CBD came into force in 1993 with great implications for access to genetic resources. In addition, the centres entered into an agreement with FAO in 1994 bringing their germplasm collection under the international network of *ex situ* collections. Further, the WTO Multilateral Trade Agreement under which the Trade Related Aspects of Intellectual Property (TRIPs) falls came into force in 1995. The TRIPs Agreement obliges all WTO member countries to enact and enforce legislation governing intellectual property. All CGIAR member countries are members of the WTO and virtually all countries within which the CG centres operate are WTO members.

A panel on IPRs was set up in 1994 whose report included recommendations on IP management by centres. The Guiding Principles on IP and Genetic Resources emanated from these recommendations. The Guiding Principles address various issues such as sovereignty, farmers' rights, biosafety and IP protection. The CG system has an unusual legal structure. The system is no more than an alliance; it has no legal status. As such system wide documents are often in the form of guiding principles. Where there are CG policies, these have to be adopted by the individual centres whose interpretation and implementation of the policies is not always uniform. Regarding IP, the governing and guiding documents are numerous. Firstly, there are the international instruments: the Treaty, the Convention on Biological Diversity (CBD) and the ubiquitous TRIPs Agreement. Secondly, there is the 1994 agreement signed between the CG centres and the Food and Agriculture Organisation; this governs non-Annex 1 *ex situ* germplasm collected before the Treaty came into force. Thirdly, there are the various system level IP guiding principles and finally, at the centre level are the individual centres' IP policies, material transfer agreements (MTAs) and other contracts.

In enquiring if the IP policies allow for the mitigation of the excludability effect, this section looks at the provisions relating to whether the CG centres and third parties can seek IP protection for research products from both designated germplasm and centre bred material.

Can CG centres seek IPRs for research products from designated germplasm and centre bred material?

As per the terms of the guiding principles, centres can only seek IP protection where either, protection is needed to facilitate technology transfer, or protection is otherwise needed to protect the interests of developing nations. A template for IP policy statements recently approved by the CG Committee on Genetic Resources Policy places emphasis on the centres' need for full disclosure into the public domain, sharing of materials, data and information generated by centres. It exhorts the centres to pursue publication as their basic IP policy and to seek IPRs only when necessary to serve the poor. In all instances, the centre concerned must disclose the reasons for seeking protection. The template list situations where this may be acceptable as:

" i. To engage in public and private partnerships which pursue mission-based research;
ii. to ensure ready access;
iii. to avoid possible restrictions arising from "blocking" patents and to ensure Centre's ability to pursue its research without undue hindrance;

iv. to ensure the effective transfer of technology, research products and other benefits to the resource poor.

Although the template is not intended to replace the IP policy statements or the MTAs, it is important in that it clarifies statements in the previous documents and is intended to ensure that individual centres' statements address all the relevant issues "in a consistent and harmonious manner."

The policy and MTAs emphasise that IP protection should not be seen as a means for securing financial returns although in some cases the reality is that IP protection may be a source of operating funds.

Cells, organelles, genes and molecular constructs can be patented, even those isolated from designated germplasm. Permission from the relevant centre has to be sought however, and this will be given only after consultation with countries of origin of the relevant germplasm (where this is known or can be readily identified). This is in accordance with the requirements of the Convention on Biological Diversity (CBD).

An instance where protection may be sought is if it helps promote collaborative partnerships which speed up the development of new products and services and facilitates their deployment to the end users – the poor farmers in developing countries. CG centres may enter into agreement with right holders of protected material but only to facilitate access and availability of the material to developing nations and only when the benefits of such collaboration outweigh the potential disadvantages. In all cases, the requirements mentioned above must be met.

In deciding whether or not to seek IP protection, CG centres must consider the transaction cost and the incident management burden (Maredia & Erbisch, 1998). Even though monetary gains by themselves should not determine the decision of the CG centres whether or not to protect a technology, they are nonetheless important and have to be considered in the decision making process.

Can third parties seek IPRs for research products from designated germplasm and centre bred material?

Under the CG guiding principles, designated germplasm is not subject to IP protection or legal claim by centres or other recipients. The FAO/CG centres' Agreement categorically states that the 'Centre shall not claim legal ownership over the designated germplasm, nor shall it seek any intellectual property rights over that germplasm or related information.' The Treaty governs all Annex 1 *ex situ*/designated germplasm (as well as Annex 1 centre bred material) and states that recipients of material from the Multilateral System "shall not claim any intellectual property or other rights that limit the facilitated access to the plant genetic resources for food and agriculture, or their genetic parts or components, in the form received from the Multilateral System." The Treaty does not define what 'in the form received' means leaving this open to various interpretations.

Designated germplasm or centre bred material can be used by recipients for breeding purposes, research and training. The recipients include the private sector. The recipients may seek protection for the *resulting products* of breeding through PBRs. The recipients cannot preclude others from using the original material. Unlike patenting which requires the relevant centre's approval, third parties do not need permission to seek PBRs on research products from designated germplasm or centre bred material. The CG guiding principles fail to address this. What constitutes 'resulting products' is not defined and it is therefore unclear how much development to the original material is required before a recipient can claim PBRs over the 'resulting product'.

Do CG centres have the authority to allow third parties to seek IPRs for research products from designated germplasm and centre bred material?

There has been considerable debate on the question of the centres' authority to permit third parties to exploit genetic resources held in trust. Designated germplasm is generally considered to be held in trust by the CG centres. Under the trustee principle, a trustee's duty is to keep control of and preserve trust property. One of the issues arising from this is whether a CG centre can permit a third party to secure IP rights over germplasm held in trust (Blakeney, 2002). This question does not seem to have been answered directly by the CGIAR at the policy level although it can be argued that if the ultimate end of allowing third parties to seek IP protection for research products from designated germplasm and centre bred material is to benefit the poor, and facilitate the CG centre fulfil its mandate, then it would appear that the CG centre would be acting within its trustee obligations. As the various policy documents currently stand, this issue of trusteeship does not seem to be appreciated thereby allowing for the IP protection of material by third parties for their own commercial interests.

Being the owner of centre bred material, a centre has authority to allow third party to seek IPRs for research products derived from the centre developed material. The transfer of this material to recipients is however under the Treaty's standard material transfer agreement (for Annex 1 PGRFA), the centre specific MTA (for non Annex 1 pre Treaty material) and according to the CBD, the agreement between the centre and the host government and other applicable national laws (for non Annex 1 post Treaty material). As such, the conditions under these instruments must be respected.

The CG Centre Directors' Committee Statement in 1998 identified areas that need further clarification. Among these were the issues of benefit sharing for IPRs on centre bred material and whether and when to allow for IP protection on centre bred material where there was no significant input by the recipient or when more than one recipient in a country requests permission to apply for IPRs (Bragdon, 2000). These are still outstanding issues as is what to do with plant genetic material developed jointly with other partners including the private sector. The alliance of CG centres is currently drafting a new policy on intellectual assets which could substantially alter the system's current guiding principles.

There is no doubt that the treaties, policies and agreements discussed above contemplate the use of IP by the CG centres and by recipients of plant genetic material held and developed by the centres. The spirit underlying these instruments is in line with keeping the centres' research products in the public domain.

Balancing the provision of public goods and the use of IPRs

The *exercise* of IPRs in a manner ensuring that protected products are maintained in the public domain as much as possible goes beyond the creation of 'public domain friendly' policies. Whilst this is an important first step, implementation of those policies and agreements is crucial in balancing the equation between public goods and private rights. The use of IPRs in the CG centres is relatively recent; most research projects with potential or actual proprietary technology are ongoing and it could take a while before the effect of using IPRs is seen downstream.

An example of a completed project which illustrates the *exercise* of IPRs in this regard is the Golden Rice project. This was a product development partnership between the International Rice Research Institute (IRRI, one of the CG centres) and various private partners whose objective was to create rice fortified with beta-carotene in order to address the pervasive vitamin A deficiency in rice growing regions. The freedom to operate review showed that about 70 patents (including applications) were applicable to the improved rice. This potential constraint was resolved by 'a straightforward IP management strategy'. Krattiger & Potrykus (2007:12) report that 'contrary to what many commentators state, the licensing process was relatively uncomplicated, with the involvement of commercially experienced people.'

Judging from the number of patents involved and the number of licenses issued, the process could only have been uncomplicated *because* of the involvement of commercially and IP savvy people (public relations and other factors aside). Moreover, a lot of the IP capacity particularly regarding negotiation must have been from the private sector: 'These core patents were licensed to Zeneca… [which] then negotiated access to *all* possibly necessary patents, including intellectual property from [other companies].' (Krattiger & Potrykus, 2007: 12)

The Zeneca-led negotiations resulted in all the companies providing access to their technologies 'free of charge for defined humanitarian research and use of Golden Rice in developing countries' (Krattiger & Potrykus, 2007: 12). Golden Rice is available under humanitarian use which is defined as use in developing countries by resource-poor farmers (earning less than US$10,000 per year from farming). This provision is an example of how the excludability effect of IPRs can be reversed to ensure the public's access to protected technology.

Another example of creative exercise of IPRs is a partnership between Donald Danforth Plant Science Centre (a US not-for-profit plant sciences research institute), Sathguru Management Consultants and the International Crops Research Institute for Semi Arid Tropics (ICRISAT, a CG centre) for the development of groundnuts resistant to tobacco streak virus, a disease that decimated groundnut production in India with losses of more than US$65million in 2000. The partnership acquired coat protein (CP) technology (vital for conferring resistance to the viral infection) from Monsanto through a non-assert agreement. This allowed the CP technology to be used for non profit public good. The CP technology is available free of royalties and upfront payments to public institutions planning to develop the varietal groundnut (Medakker

& Vijayaraghavan, 2007). Partnership was able to negotiate for the CP technology from Monsanto through a non-assert agreement demonstrating the need for IP capacity. The non-assert agreement itself is an example of how protected technology can be made available to the public.

Open source biotechnology is another option increasingly cited as having the potential to mitigate the excludability effect in IPRs thereby balancing private rights with the provision of public goods. Similar to the open source software model this entails pooling together technologies which are then made freely available under specified terms. The practical workings of open source biotechnology are however yet to be put to test. An often cited example of open source biotechnology is CAMBIA's open technology bank called BIOS. CAMBIA is an Australian non profit organisation that engages in life sciences based research. BIOS is a technology development and sharing initiative where protected technology is freely available for users who have to contribute the improvements they make to the core toolkit under the terms of the Biological Open Source Licence.

The use of non-assert agreements, humanitarian licenses and other contracts that ensure the public goods mandate of public research organisations is not compromised requires IP capacity including that in drafting appropriate clauses and contracts, IP negotiation with third parties and research partners and overall IP management. The same goes without saying in establishing or being involved in any open source arrangement.

Conclusion

The characteristics of a good generally determine whether it is public or private. 'Publicness' and 'privateness' are however not innate properties – goods move along the public good – private good continuum meaning that in many instances, a good could be produced by the private sector, the public sector, other sectors or any combination of these. Agriculture research is an impure public good and its provision requires a multiple of authorities and actors, as do most mixed goods.

IPRs introduce excludability to public goods. There is therefore an inherent theoretical conflict in the application of IPRs to public goods. International Agriculture Research Centres (IARCs) and other public research organisations increasingly find themselves in situations where they have to protect their research products through IPRs or where they use products protected by third parties. To fulfil their public goods mandate, these organisations have to *exercise* IPRs in a manner that mitigates their *existence*. There are ample examples in agriculture and elsewhere that illustrate that the existence of IPRs need not hinder the accessibility of protected technology by the public.

But IARCs and other public research organisations particularly those in developing countries need to invest in IP capacity in order to use innovative IP management and strategies that address the paradox of using private rights in the provision of public goods. Some public research organisations and non profit organisations are currently experimenting with creative IP mitigation strategies such as humanitarian use and non-assert licenses and open source biotechnology. Their uptake in common biotechnology practice is yet to be seen.

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